

TABLE OF CONTENTS

SECTION 500 CONCRETE	500-1
501 DESCRIPTION	500-1
502 MATERIALS	500-1
502.01 Cement	500-1
502.02 Aggregate	500-1
503 STORAGE OF MATERIALS	500-4
504 AIR-ENTRAINING ADMIXTURES	500-4
505 CONCRETE ADMIXTURES	500-4
506 QUALITY OF CONCRETE	500-4
507 MIXING AND PLACING	500-5
507.01 Preparation of Equipment and Placing of Deposit	500-5
507.02 Conveying	500-6
507.03 Placing	500-6
508 CURING AND PROTECTING	500-6
508.01 Burlap or Mat Curing	500-6
508.02 Wetted Earth Curing	500-7
508.03 Curing Compounds	500-7
508.04 Protection in Cold and Freezing Weather	500-7
508.05 Protection in Hot Weather	500-8
509 CONCRETE CONSTRUCTION FLATWORK: SEE DETAILS	500-8
509.01 General	500-8
509.02 Combination Curbs and Gutters	500-8
509.03 Sidewalk and Pedestrian Ramps	500-11
509.04 Crosspans	500-13
509.05 Driveway Approaches	500-14

SECTION 500 CONCRETE

SCOPE: The work under this Section includes the furnishing of all labor and materials necessary for the construction of nonreinforced concrete according to the plans and these specifications.

501 DESCRIPTION

Concrete shall be composed of Portland Cement, fine and coarse aggregates and water, together with any specified additives or admixtures proportioned and mixed in conformity with the following specifications.

502 MATERIALS

502.01 Cement

Portland Cement shall conform to the specifications for Portland Cement (ASTM C-150) and specifications for air-entrained Portland Cement (ASTM C-175 or C-595) and shall be Type IIA (Air-Entraining) cement, unless sulfate conditions allow otherwise. Table 2.2.3 in Chapter 2.2 of ACI 201 presents cement recommendations for sulfate resistances. In addition to the standard chemical requirements for Portland cement in ASTM C-150, the maximum percent of alkalis shall be as specified in Table 2 of ASTM C-150 for low alkali cement. Other types of cement or admixtures are only to be used upon approval by the Engineer.

502.02 Aggregate

The amounts and proportions of fine and coarse aggregates shall be such as to produce a plastic, workable mix which can be readily placed into the corners and angles of the forms and around reinforcement and other embedded fixtures without undue accumulation of water or laitance on the surface, and such that there will be no honeycombing in the structure.

Proportions of fine and coarse aggregates shall be such that the ratio of the coarse to the fine aggregate shall not be less than one (1) nor more than two (2).

If, in the judgment of the Engineer, based on laboratory tests, concrete aggregates from a given source are detrimentally reactive with alkalis in Portland Cement, they shall be used in concrete in combination with low-alkali cement only.

Concrete aggregates shall consist of sand-gravel, gravel, crushed stone, or limestone; the particles shall be clean, hard, tough, durable, of uniform quality, free of any soft, thin, or elongated pieces, disintegrated stone, dirt, organic or other injurious materials occurring either free or as a coating. All aggregate must be supplied from a source approved by the City Engineering Division. Aggregate shall be made of the following sub sections:

A. Fine Aggregate. Fine aggregate shall conform to ASTM C-33. Fine aggregate shall consist of sand or other inert materials, or combinations thereof approved by the Engineer, and having hard, strong, durable particles, free from adherent coating. Fine aggregate shall be thoroughly washed to remove shale, coal, mica, clay, loam, alkali, organic matter or other deleterious matter.

1. Deleterious Substances. The amount of deleterious substances in the washed aggregate shall not exceed the following values:

- a. Clay lumps & Friable Particles, % by weight 3.0 MAX.
- b. Coal & Lignite, % by weight 1.0 MAX.
- c. Friable Particles, % by weight 1.0 MAX.
- d. Sand Equivalent 75 MIN.
- e. Fineness Modulus 2.3-3.1 MAX.
- f. Sodium Sulfate Soundness, % by weight 10 MAX.

Grading. Fine aggregate shall be regularly graded from coarse to fine in two (2) sizes and when tested by means of the U.S. Standard, sieves shall conform to the following requirements expressed as percentages by weight:

Sieve Size or Test Procedure	Percent Passing or Test Requirement *(Concrete Sand)
3/8"	100
No. 4	95-00
No. 8	80-00
No. 16	50-85
No. 30	25-60
No. 50	5-30
No. 100	0-10
No. 200	** 0-3

*The fine aggregate shall have not more than 45% passing any sieve and retained on the next consecutive sieve.

- B. Coarse Aggregate. Gravel and crushed stone shall conform to ASTM C-33. Coarse aggregate shall consist of gravel, crushed stone, or other inert material or combinations thereof approved by the Engineer, and having hard, strong, durable pieces free from adherent coating. Coarse aggregate shall be thoroughly washed of clay, loam, bark, sticks, alkali, organic matter, shale, coal, mica, or other deleterious material.

1. Deleterious Substances. The amount of deleterious substances shall not exceed the following values:

a. Clay lumps & Friable Particles, % by weight	3.0 MAX
b. Coal & Lignites, % by weight	0.5 MAX
c. Sum of Clay Lumps, Friable Particles and Chert, % by weight	5.0 MAX
d. Abrasion, % by weight	50 MAX
e. Sodium Sulfate Soundness, % by weight	12 MAX

Wood waste is defined as all material which, after drying to constant weight, has a specific gravity less than 1.0.

2. Grading. Coarse aggregate, when tested in conformity with ASTM C-136, shall conform to one or more of the following gradings as called for elsewhere in the specifications, special provisions or on the plans.

Sieve size or Test Procedure	Percent Passing or Test Requirement		
	No. 357	No. 467	No. 57
2 1/2"	100	--	--
2"	95-100	100	--
1 1/2"	-	95-100	100
1"	35-70	--	95-100
3/4"	--	35-70	--
1/2"	10-30	--	25-60
3/8"	--	10-30	--
No. 4	0-5	0-5	0-10
No. 8	--	--	0-5
No. 200	*1.0 MAX.	*1.0 MAX.	*1.0 MAX.

*1.5 MAX. for crusher fines

NOTE: Size No. 67 may also be used on a case-by-case basis when approved by the Engineer.

The above values are in percentages by weight from AASHTO M-80 No. 357 and 467.

Other gradations may be used when specified by the Engineer.

- C. Concrete Strength. Concrete made from the coarse aggregate, graded to comply with the requirements of these specifications, combined with the specified proportions of cement and the fine aggregate proposed for use with the coarse aggregate shall develop a compressive strength at the age of 28 days of not less than 4000 psi.
- D. Water. Water used in concrete shall be potable, clean, and free from deleterious amounts of acids, alkalis, or any organic materials.

503 STORAGE OF MATERIALS

Cement and aggregates shall be stored in such a manner as to prevent deterioration or the intrusion of foreign material.

504 AIR-ENTRAINING ADMIXTURES

All air-entraining admixtures shall contain an air entraining agent conforming to ASTM C-260. The entrained air content of all concrete shall be controlled at 6% (-1+2).

505 CONCRETE ADMIXTURES

Calcium Chloride shall not be used as an antifreeze agent. Calcium Chloride as an accelerating agent in amounts not to exceed 1.5% by weight of cement may be used upon the approval of the Engineer.

506 QUALITY OF CONCRETE

Specified Compressive Strength at 28 Days 4000 PSI	Maximum Water/Cement Ratio by Weight 0.45
Minimum Cement Content per Cubic Yard of Concrete 564 lbs	

The proportioning of aggregate to cement shall be such as to produce a good workable mix and the slump shall be a maximum of four inches (4") as per ASTM C-143. The equipment for batching of the aggregates, cement, water, and air-entraining agent shall be such that accurate control can be held over the various constituents.

Ready-mixed concrete shall comply with ASTM C-94 for ready-mixed concrete and the following specifications:

Time of Haul: Concrete transportation in truck mixers or truck agitators shall be delivered to the site of work and completely discharged within a period of ninety (90) minutes after the cement comes in contact with the mixing water or with the combined aggregates when the combined aggregates contain free moisture in excess of 2% by weight. If hot weather exists causing the temperature of the concrete to rise above 90 degrees Fahrenheit, then the time of haul shall be within a period of sixty (60) minutes.

Production and Delivery: The production and the delivery of ready-mixed concrete shall be such that placing and finishing shall be continuous in so far as the operations require.

Testing of Concrete: Samples for test cylinders should be taken not less than once each day or not less than each 50 cubic yards of concrete placed. This requirement applies to both reinforced and unreinforced concrete work unless otherwise directed by the Engineer. For structural elements, the Engineer may call for additional samples for strength testing.

A minimum of four cylinders shall be prepared for each sample of concrete. One cylinder shall be strength tested after 7 days of curing time. Two cylinders shall be strength tested after 28 days of curing time.

In the event, the initial 28 day cylinder should fail, the remaining two cylinders should be strength tested after 45 days of curing time.

Samples for slump and air-content testing should be taken for each truck delivery or not less than each 12 cubic yards where site batching is performed. The Engineer may vary the frequency of sampling and testing depending on site conditions.

The preparation, handling, storage and testing procedures of all samples shall be in conformance with the applicable ASTM and AASHTO standards.

507 MIXING AND PLACING

507.01 Preparation of Equipment and Placing of Deposit

Before any concrete is placed, all equipment for mixing and transporting the concrete shall be cleaned. All debris and ice shall be removed from the places to be occupied by the concrete. Forms shall be thoroughly oiled. Water shall be removed from the place of deposit before concrete is placed. Newly placed concrete shall be protected from any water damage. The top six (6) inches of the bedding or subgrade shall be graded and compacted to a minimum density of 90% ASTM D-1557 prior to placement of the concrete.

When concrete placed on earth surfaces is necessary, the surfaces shall be free from frost, ice, mud and water.

507.02 Conveying

Concrete shall be conveyed from the mixer to the place of final deposit by methods which will prevent the separation or loss of materials. Concrete shall not be free dropped from more than four (4) feet.

Equipment for tremming, chuting, pumping, and pneumatically conveying concrete shall be of such size and design as to insure a practically continuous flow of concrete at the delivery end without separation of materials.

507.03 Placing

Concrete shall be deposited as practicable in its final position to avoid segregation due to rehandling or flowing. Concrete shall be placed at such a rate that it is at all times plastic. The practice of moving concrete from one point another by the use of vibrators is expressly forbidden. Vibrators shall be used to consolidate the concrete, not to transport it. No concrete that has partially hardened or been contaminated by foreign materials shall be deposited on the job site nor shall retempered concrete be used. All concrete shall be thoroughly consolidated during placement. It shall be thoroughly worked around reinforcement and embedded fixtures and into the corners of forms.

508 CURING AND PROTECTING

All concrete shall be cured for a period of seven (7) days. Concrete shall be kept moist for at least five (5) days after placement. The curing medium used shall be applied so as to prevent checking and cracking of the finish surface of the concrete immediately after the finishing operation is completed, and it shall be maintained so as to prevent loss of water from the surface and edges of the concrete for the entire duration of the curing period. The contractor shall use one of the following methods:

508.01 Burlap or Mat Curing

Cotton mats or burlap shall be kept continuously (not periodically) moist for the duration of the curing period. After the forms are removed, the cotton mats or burlap shall be folded down over the back of the curb to subgrade. All mats or burlap covering material shall be approved by the City Engineering Division.

508.02 Wetted Earth Curing

The entire surface of the concrete will be covered with earth not less than one and one-half inches (1-1/2") in depth. The earth covering shall be thoroughly wetted while it is being placed on and against the sides of the placed concrete and kept completely and continuously saturated for three (3) days and left saturated at the beginning of the fourth day. If the earth covering becomes displaced during the curing period, it shall be replaced to the original depth and saturated. Clean, loose straw or hay at the rate of three (3) pounds to the square yard may be substituted for the earth material saturated under the same requirements.

508.03 Curing Compounds

If curing compounds are used, they shall be thoroughly agitated during use and shall be uniformly sprayed in a single coat. Application shall be on all concrete surfaces at a rate not to exceed 150 square feet per gallon in place. Application shall be made as soon as all surface water sheen has disappeared from the concrete surface. If concrete surfaces become partially dry, they shall be thoroughly moistened with water immediately prior to the application of the compound. If in the opinion of the Engineer pinholes exist, a second coat shall be immediately applied at right angles to the first in the affected area. Under no circumstances shall curing compound be used on surfaces to which new concrete is to be bonded. All curing compounds shall conform to ASTM C-309.

If, at any time during the curing period any of the forms are removed, a coat of curing compound shall be applied immediately to the exposed surface.

508.04 Protection in Cold and Freezing Weather

In cold weather concrete shall be mixed and placed only when the ambient temperature is at least forty degrees (40) Fahrenheit, in the shade and rising. For ambient temperatures below 40 degrees, permission from the City Engineering Division must be obtained prior to placing of concrete.

In freezing weather, suitable means shall be provided for mixing and maintaining concrete at a temperature of at least fifty degrees (50) Fahrenheit, for seven (7) days after placing. Adequate equipment shall be provided for heating the concrete materials and protecting the concrete during freezing or near freezing weather. Under no circumstances shall frozen materials or materials containing ice be used for the preparation of concrete. Salt, chemicals or other foreign materials shall not be mixed with the concrete for the purpose of preventing freezing. All materials, reinforcement, forms, fillers, and ground with which the concrete is to come in contact shall be free from frost.

The housing, covering, or other protection used in connection with curing shall remain in place and intact for at least forty-eight (48) hours after the artificial heating is discontinued.

508.05 Protection in Hot Weather

In hot weather the Contractor may use shaved ice in the mixing water to reduce the temperature of the concrete at the mixer, but there shall be no ice in the concrete when it is discharged from the mixer. Concrete temperature shall be placed at 50 degrees - 90 degrees Fahrenheit. All concrete deposited in hot weather shall have the proper temperature control so that there will be no difficulty from loss of slump, flash set, or cold joints.

509 CONCRETE CONSTRUCTION FLATWORK: SEE DETAILS

509.01 General

This section of the specification provides for the operations and construction of concrete combination curbs and gutters, valley gutters, crossspans, driveway approaches, and sidewalks to be constructed within street right-of-way except for patterned concrete median, refer to detail D-24. The City of Colorado Springs recognizes three (3) types of curb and gutter: 8" vertical type, ramp style and 6" median type.

No concrete shall be placed adjacent to concrete that has taken its initial set unless the specified expansion joint is provided.

The contractor shall mark in every fifty (50) lineal feet of sidewalk and curb & gutter, and in every crossspan, valley gutter and driveway, by stamping his name and the year of construction. The stamped letters shall be one (1) inch high and one-fourth (1/4) inch deep.

509.02 Combination Curbs and Gutters

Maximum slump 4", minimum 6 sacks cement, 4000 psi at 28 days compressive strength.

- A. Materials. Concrete for construction of combination curbs and gutters shall be as specified previously in Sections 502 through 507.

- B. Expansion Joint Materials. Expansion joints a maximum of every 50 feet shall be constructed with preformed expansion joint filler, conforming to Federal Specifications MR-F-341 or wood board conforming to AASHTO Designation M-90 and placed at curb returns, against fixed objects, at points of sharp radius and between adjacent sidewalk and curb at all curb returns.
- C. Joint Sealing. Materials for sealing and for filling all joints and for filling premolded expansion joints shall be rubber asphalt type joint seal. Sealing material shall be applied in strict accordance with the manufacturer's directions. All expansion joints shall be sealed.
- D. Contraction Joints. Contraction joints shall be installed every ten feet (10') and shall be made by insertion of a one-eighth inch (1/8") thick steel template at right angles to the curb and 1-1/2" deep into the concrete.
- E. Forms. Forms may be of metal or seasoned shiplap lumber of a depth equivalent to that of the work prescribed.

Forms for concrete shall be used for all vertical surfaces, mortar type, true to required lines and grades, and of sufficient strength to maintain shape during the placing of the concrete and the mechanical finishing without springing or settling. Wood forms shall be two inch (2") (nominal) surfaced plant; metal forms shall be approved section and shall have a flat surface on the top of not less than one and three-quarter inches (1-3/4"). Forms shall be thoroughly cleaned of all dirt, mortar, and foreign matter before being used. Unit lengths of forms shall be jointed in advance of the point of placing concrete. Flexible, curved, or wood forms of the proper radii shall be used for curbs having a radius of less than two hundred feet (200'). All forms shall have dimensions of the City of Colorado Springs specified curb and gutter sections.

Forms shall be equipped with not less than three (3) staking points per each ten feet (10') of length with means for securely locking the form to each stake. Flange braces and staking pockets shall extend outward on the base not less than two-thirds (2/3) of the height of the form.

Forms that are bent, twisted, warped, broken, or forms that have battered or splintered top faces shall be removed from the job. Repaired forms shall not be used until they have been inspected and approved by the Engineer. The top and face of a form shall not vary from a true plane by more than one-fourth inch (1/4") in ten feet (10').

The building of pedestals of earth or other materials upon which to rest the forms in order to bring them to the grade will not be permitted. Sufficient forms shall be provided so that they may remain in place 12 hours or more after the concrete has been placed before it is necessary to move and

reuse them. Forms shall be cleaned and oiled before concrete is placed against them. The alignment and grade of forms shall be checked and approved immediately before placing the concrete.

Forms which show a variation exceeding the surface test required shall be reset or removed as directed.

- F. Removal of Forms. Forms shall be removed within twenty-four (24) hours after the placement of concrete. After the forms have been removed, no honeycomb or minor defects will be acceptable by the Engineer, unless acceptable repairs are made.
- G. Preparation of Subgrade. Where soils are encountered with R less than 32, CBR less than 15, the soils engineer will make a determination of the requirement for base course under curb and gutter based upon recommendations contained in the soils report. Select base course material and/or subgrade shall be compacted to not less than:
 - 1. For cohesive soils, 90% of Modified Proctor at $\pm 2\%$, of optimum moisture content or 95% Standard Proctor at $\pm 2\%$, of optimum moisture content.
 - 2. For noncohesive soils, 92% Modified Proctor at $\pm 2\%$ of optimum moisture content or 97% Standard Proctor at $\pm 2\%$ of optimum moisture content.
 - 3. For expansive soils, 88% Modified Proctor at 3% above optimum moisture content or 93% Standard Proctor at 1% above optimum moisture content.
- H. Placement and Finish. After placement in the forms, the concrete shall be thoroughly spaded or mechanically vibrated so that there will be no air spaces in the mass. The combination curb and gutter shall be brought to proper surface by running a straight-edge over the steel templates with a sawing motion, so as to fill all holes and depressions. Immediately after using the straight-edge, the surface shall be floated with a wood float, trowel led with a steel trowel, and edged with an approved edger. Finishing with a steel trowel shall be accomplished without adding water to the surface. Excessive water, laitance or other inert material shall be floated from the surface.

Just before the concrete takes its initial set, the surface shall be brushed with a soft bristle brush so as to remove all trowel marks and leave a uniform appearance. Brushing shall be at right angles to the curb line. No more concrete shall be poured in one day than can be finished before dark, the same day. No concrete that has begun to set shall be deposited in the forms.

No concrete shall be placed if there is not enough to completely fill one complete ten foot (10') curb and gutter section. No concrete shall be deposited adjacent to concrete that has already taken its initial set (90 minutes or older), unless the specified expansion joint is provided.

- I. Finished Work. The work shall be performed in a manner which results in a curb and gutter constructed to specified line and grade and uniform in appearance and structurally sound. Curbs found with unsightly bulges, ridges, low spots in the gutter or other defects shall be removed and replaced at the Contractor's expense. When checked with a ten foot (10') straightedge, grade shall not deviate more than one fourth (1/4") inch and alignment shall not vary more than three eighths (3/8") inch.
- J. Curing and Protection. The concrete shall be protected and cured as specified previously in Section 508.
- K. Backfill. Immediately after the curb and gutter have been properly cured, backfill shall be placed and compacted against the back of the curb to the satisfaction of the Engineer, to prevent any movement of the curb and/or gutter during the placing of the street pavement. Placement of asphalt paving shall be no sooner than seven (7) days after placing of concrete except when the threat of erosive rains exists.
- L. Measurement and Payment. Shall be paid for at the contract unit price, per linear foot, measured along the face of curb for the actual length of authorized curb and gutter constructed. This item includes all materials such as concrete, forming and form removal, finishing and curing of concrete, grading, compaction and any other work items required by the plans and specifications.

509.03 Sidewalk and Pedestrian Ramps

- A. General. Sidewalks shall be four inches (4") in thickness and a minimum four feet (4') in width. Pedestrian ramps shall be six inches (6") in thickness. Sidewalks shall have a minimum thickness of six inches (6") residential and eight inches (8") commercial for the full width of all driveway approaches. Sidewalks shall have a minimum slope of one quarter inch (1/4") per foot toward the top of the curb. Maximum slump 4", minimum 6 sacks cement, 4000 psi at 28 days compressive strength.

Concrete for construction of sidewalks and pedestrian ramps shall be as specified previously in Sections 502 through 507, with the exception that the maximum size for aggregate shall be three-quarter inch (3/4") rock. (ASTM C-33, Size No. 67)

- B. Preparation of Sub Grade. Before the placement of concrete, the area under the section shall be graded and compacted to not less than:
1. For cohesive soils, 90% of Modified Proctor at $\pm 2\%$, of optimum moisture content or 95% Standard Proctor at $\pm 2\%$, of optimum moisture content.
 2. For noncohesive soils, 92% Modified Proctor at $\pm 2\%$ of optimum moisture content or 97% Standard Proctor at $\pm 2\%$ of optimum moisture content.
 3. For expansive soils, 88% Modified Proctor at 3% above optimum moisture content or 93% Standard Proctor at 1% above optimum moisture content.

Sub grade shall be compacted to not less than as stated in (2) above.

The sub grade and/or base course shall be lightly moistened immediately before the placement of concrete.

- C. Expansion Joints. Expansion joints shall be one-half (1/2") inch premolded and joints shall be placed where sidewalks end at curb returns, against fixed objects, at points of sharp radius, and between sidewalk and all driveway slabs. Expansion joints shall be placed a maximum of every fifty (50) feet.
- D. Contraction Joints. Contraction joints shall be installed at intervals not to exceed five feet (5') and shall be at least one and one-half (1-1/2") inch in depth.
- E. Placement and Finish. In depositing concrete against the forms, care shall be taken to work the fine portions of the aggregate surface so as to leave the surface in a uniform and smooth condition. The concrete shall be worked sufficiently to produce a dense mass. The surface shall be struck off with a straight-edge. When the concrete has set sufficiently, the surface shall first be trowelled, then broomed with a fine hair push broom at right angles to the centerline of the sidewalk. Pedestrian ramps shall be broomed with a coarse hair push broom, parallel with the scoring.
- F. Tolerance. The top face of the slab shall not vary from the true grade and alignment by more than one-fourth inch (1/4") in ten feet (10') when checked with a straight-edge. Slope of the grass portion of the parkway shall be 1/4" to 1-1/2" per foot above the top of curb. Slope of sidewalk shall be 1/4" to 1" per foot.
- G. Curing and Protection. The concrete shall be protected and cured as specified previously in Section 508.

- H. Measurement and Payment. All sidewalk and pedestrian ramps shall be measured in square feet. Payment will be based on the number of square feet constructed in place at the contract unit price per square foot, unless otherwise noted in the bid proposal.

509.04 Crosspans

- A. General. Minimum crossspan bases shall be seven feet (7') wide with a 45 degree angle slope on each side allowing six feet (6') of exposed concrete surface. The crossspan shall be sloped from each edge to the middle at the slope rate of one-quarter inch (1/4") per foot maximum. The depth of concrete shall be eight inches (8") using 6x6-4, 4 wire welded fabric or #4 @ 18" E.W. Concrete for construction of crosspans shall be as specified previously in Sections 502 through 507. One inch (1") smooth steel dowels with sleeves or caps shall be installed at expansion joints, and when pouring half pans, spacing shall be at one foot (1') center.
- B. Preparation of Subgrade. Subgrade shall be compacted to not less than:
1. For cohesive soils, 90% of Modified Proctor at $\pm 2\%$, of optimum moisture content or 95% Standard Proctor at $\pm 2\%$, of optimum moisture content.
 2. For noncohesive soils, 92% Modified Proctor at $\pm 2\%$ of optimum moisture content or 97% Standard Proctor at $\pm 2\%$ of optimum moisture content.
 3. For expansive soils, 88% Modified Proctor at 3% above optimum moisture content or 93% Standard Proctor at 1% above optimum moisture content.

When the temperature of the surrounding atmosphere is fifty degrees (50) Fahrenheit or above, the sub grade and/or base course shall be lightly moistened immediately before the placement of the concrete.

- C. Expansion joints. Expansion joints shall be one-half inch (1/2") premolded and placed completely through the section at fifty foot (50') intervals and at curb returns. One inch (1") smooth steel dowels with sleeves or caps at two (2') foot centers shall be placed in the joint.
- D. Placement and Finish. The concrete shall be placed in the forms and thoroughly spaded or mechanically tamped so that there will be no air spaces in the mass. Crosspans shall be brought to proper surface by wood floating so as to fill all holes and depressions. Just before the concrete takes its initial set, the surface shall be brushed with a soft bristle brush, so as to remove all trowel marks and to leave a uniform appearance. Brushing shall be parallel to the center line of the crossspan.

- E. Curing and Protection. The concrete shall be protected and cured as specified previously in Section 508.
- F. Measurement and Payment. Shall be paid for at the contract unit price for each unit actually installed. Each gutter apron with monolithic curb radius shall be paid for separately. This item includes forming and form removal, purchase and placement of concrete, finishing and curing of concrete, grading, compaction, and any other work items required by the plans and specifications.

509.05 Driveway Approaches

- A. General. Driveway approaches shall be of two (2) types:
 - 1. Type D-16A. Type A shall be constructed from cuts in eight inch (8") vertical curb. The curb head shall be transitioned from eight inches (8") to one and a half inches (1-1/2") at a distance of four feet (4'). The sidewalk is attached and four feet (4') wide. (See Details)
 - 2. Type D-16B. Type B is the same as Type A, except the sidewalk is detached and four feet (4') wide. (See Details)

Concrete for construction of drive approaches shall be as specified previously in Sections 502 through 507. Depth of concrete shall be six (6") inches, except for commercial driveways in which case the depth shall be eight inches (8") minimum.

- B. Expansion Joints. Shall be one-half inch (1/2") premolded and joints shall be placed between drive approaches and either existing sidewalk or driveway beyond the property line.
- C. Preparation of Sub Grade. Sub grade shall be compacted to not less than:
 - 1. For cohesive soils, 90% of Modified Proctor at $\pm 2\%$, of optimum moisture content or 95% Standard Proctor at $\pm 2\%$, of optimum moisture content.
 - 2. For noncohesive soils, 92% Modified Proctor at $\pm 2\%$ of optimum moisture content or 97% Standard Proctor at $\pm 2\%$ of optimum moisture content.
 - 3. For expansive soils, 88% Modified Proctor at 3% above optimum moisture content or 93% Standard Proctor at 1% above optimum moisture content.

When the temperature of the surrounding atmosphere is fifty degrees (50) Fahrenheit or above, the sub grade and/or base course shall be lightly moistened immediately before the placement of the concrete.

- D. Placement and Finish. The concrete shall be placed in the forms and thoroughly spaded so that there will be no air spaces in the mass. The drive approaches shall be brought to proper surface by running a straight-edge over the forms with a sawing motion so as to fill all holes and depressions. Immediately after using the straight-edge, the surface shall be floated with a wood float. Just before the concrete takes its initial set, the surface shall be brushed with a soft bristle brush so as to remove all trowel marks and leave a uniform appearance. Brushing shall be at right angles to the curb line. No more concrete shall be poured in one day than can be finished before dark the same day. No concrete that has begun to set shall be deposited in the forms.
- E. Curing and Protection. The concrete shall be protected and cured as specified previously in Section 508.
- F. Measurement and Payment. Driveway Approaches shall be paid for at the contract unit price for each unit actually installed. This item includes forming and form removal, purchase and placement of concrete, finishing and curing of concrete, grading, compaction, and any other work items required by the plans and specifications.